

REMOVABLE STEERING WHEEL AND PEDALS FOR AUTONOMOUS VEHICLE

BACKGROUND

[0001] In an autonomous vehicle capable of driving from one location to another without one or more inputs typically provided by a human operator, e.g., steering, a steering wheel is no longer needed to pilot the vehicle. However, present vehicles typically rely on a steering wheel to house a driver-side airbag. Further, the lack of a steering wheel can handicap vehicle development by making it more difficult to place a vehicle under a driver's control. Driver control is desirable during vehicle development for purposes including, by way of example, evaluating a vehicle's response to extreme dynamic maneuvers such as rapid lane changes. An inability to manually steer the vehicle can result in placing test drivers at higher risk, as it would be more difficult to moderate or abort such maneuvers made under autonomous control, or make such maneuvers with an unfamiliar electronic control such as a joystick. Further, some vehicle owners may prefer the familiarity of being in a vehicle having a steering wheel, or a steering wheel may be needed to allow a vehicle occupant to assume control, even if the steering wheel is inactive in an autonomous mode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] FIG. 1 is a schematic side view of an exemplary driver seat and steering wheel and floor control pedal arrangement of a vehicle with a steering wheel and floor control pedals in an installed position.

[0003] FIG. 2 is a schematic side view of the exemplary driver seat and steering wheel and floor control pedal arrangement of FIG. 1 with an air bag deployed.

[0004] FIG. 3 is a schematic side view of an exemplary driver seat arrangement of a vehicle with both the steering wheel and floor control pedals removed.

[0005] FIG. 4 is a schematic side view of the exemplary driver seat arrangement of FIG. 3 with an airbag deployed.

[0006] FIG. 5 is a perspective view of the exemplary interior seat and steering wheel arrangement of FIG. 1.

[0007] FIG. 6 is a perspective view of the exemplary interior seat and dashboard arrangement of FIG. 3.

[0008] FIG. 7 is a perspective view of an exemplary steering module.

[0009] FIG. 8 is a perspective view of an exemplary filler module.

[0010] FIG. 9 is a perspective enlarge view of an exemplary dashboard niche.

DETAILED DESCRIPTION

[0011] A removable steering wheel steering wheel can be moved between an installed driving position and a stowed position, disconnected from the vehicle. An exemplary steering wheel includes an airbag. Therefore, when the steering wheel is removed, a driver-side airbag is mounted in a location other than on the steering wheel is employed. In one exemplary configuration, a steering wheel module is replaced with a filler module which includes an airbag. The system architecture enables the use of a steering wheel for development purposes, and enables the easy provision of a steering wheel as a customer-requested option.

[0012] Relative orientations and directions (by way of example, upper, lower, bottom, rearward, front, rear, back,

outboard, inboard, inward, outward, left, right) are set forth in this description not as limitations, but for the convenience of the reader in picturing at least one embodiment of the structures described.

[0013] FIG. 1, FIG. 2 and FIG. 5 show a portion of an exemplary vehicle 10 having a steering wheel 24 with a passenger cabin 12 defined in part by a roof 14 and a windshield 16 and a floor 17. An exemplary dashboard 18 is disposed between a seating area and windshield 16. A driver seat 20 is disposed in a driver seat location in the seating area of passenger cabin 12. Seat 20 is oriented in a conventional forward-facing direction. An exemplary removable steering wheel module 22 is disposed in a receiving niche 23 of dashboard 18. Niche 23, best shown in FIG. 9 is located in dashboard 18 so as to be aligned with a driver seat location and can be being selectively filled by each of the removable steering module 22 and a removable filler module 38. (See FIG. 6.)

[0014] Steering wheel module 22, best seen in FIG. 7, includes a steering module base 25 formed to fit within niche 23, and shaped to be complementary to and consistent in appearance with the rest of dashboard 18. The exemplary base 25 has a substantially line-to-line fit with dashboard 18. A trim panel provides base 25 with a pleasing appearance. Steering wheel 24 is mounted to a steering wheel support 26 of module 22. Support 26 includes a rotatable feature (not shown). Exemplary rotatable features include a short bearing-supported shaft, or, alternatively, a bearing having an attachment feature in fixed engagement with steering wheel 24. A steering wheel air bag 28 is disposed in steering wheel 24 in a well-known manner. Airbag 28 is illustrated in an inflated condition in FIG. 2. A driver occupant 29 is shown in seat 20. A selectively engageable steering module mount is incorporated into removable steering wheel module 22 and vehicle dashboard 18, providing a means of fixing module 22 to dashboard 18. The mount can include, by way of example, a sliding engagement feature in which base 25 has a rail 30 fixable thereto slidably received by a receiving channel 31, best seen in FIG. 9, fixable to dashboard 18. A pin or threaded fastener (not shown) passes through rail 30 and channel 31, locking module 22 in an installed position. Rail 30 may be characterized as a first part of the steering module mount, and channel 30 may be characterized as a second part of the steering module mount. An alternative mount (not shown) includes aligned apertures in module 22 and walls of niche 23 receiving threaded fasteners. The precise nature of the mount is not critical to the present disclosure.

[0015] The steering module mount is supplemented by additional interface elements such as a steering wheel connector. The nature of the steering wheel connector depends on whether steering wheel 24 is mechanically connected to a steering actuator as through a steering column, or is connected only by wires as with steer-by-wire systems.

[0016] When steering wheel 24 is mechanically connected to the vehicle steering actuator, the exemplary module 22 includes an upper portion of a steering column (not shown). A connector of the upper portion of the steering column with a lower steering column portion enables attaching and detaching the upper portion of the steering column of the module to and from a lower portion of the steering column that remains in the vehicle. Examples of such a connector include a slideably engaged splined shaft and sleeve combination, or alternatively a universal joint connecting the